KORNILOV, I. I.

GERM.

Titanium, properties, uses, and production. I. I. Kornilov. *Die Technik* 10, 73-[illegible](1955).—See C.A. 49, [illegible]. M. Hartenheim

Kornilov, I. I.

A new Kurnakov compound Fe_3V in the iron-vanadium system. I. I. Kornilov and V. S. Mikheev. Doklady Akad. Nauk S.S.S.R. 104, 88-90(1955).—Intermetallic compds. with metallic bond characteristics in solid solns. (Kurnakov, et al., C.A. 9, 8201) are given the name "Kurnakov compounds." The existence of Fe_3V was found by prepg. solid solns. with 0-46 at. % V from pure Fe (0.03% C) and 97% pure V (1% Al, 1.1% Fe), heating them for 20 hrs. at 1220°, raising the temp. to 1320° for 2 hrs., quenching in ice water, annealing for 70 hrs. at 900°, and air-cooling. A min. elec. resistance and hardness and max. temp. coeff. of elec. resistivity were found with 25 at. % V.

W. M. Sternberg

(1)

KORNILOV, I.I.

USSR/Chemistry - Metallurgy

Card 1/1 Pub. 22 - 19/50

Authors : Kornilov, I. I., and Budberg, P. B.

Title : Composition diagram - heat resistance of binary Ni-W alloys

Periodical : Dok. AN SSSR 100/1, 73-75, Jan 1, 1955

Abstract : The heat resistance of binary Ni-W alloys was investigated by the centrifugal method at a temperature of 800° and initial stress of 6.4 kg/mm². The most objective heat resistance criterion of the alloys tested was found to be the time when the samples reach a certain maximum bending point during their deformation under the effect of the centrifugal forces. An isothermal composition diagram was prepared for the system tested and the heat resistance is considered as a property of the metals at high temperatures. The results of this investigation serve as proof of the correctness of the physico-chemical theory regarding the heat resistance of solid metal solutions. Eight references: 6 USSR, 1 USA and 1 German (1908-1953). Graphs.

Institution : Acad. of Sc., USSR., The A.A.Baykov Metallurgical Institute

Presented by: Academician G. G. Urazov, June 3, 1954

KORNILOV, I. I. and MIKHEYEV, V. S.

"Investigating the Heat-Resistance of Iron-Chromium-Aluminum-Alloy No.2 (at 900 and 1,000° for 10,000 and 6,000 hours)," an article in the book Investigations of Heat-Resistant Alloys, publ. by AS USSR, Moscow, pp. 148-160, 1956. 160 pages.

Sum. No.1047, 31 Aug 56

KORNILOV, I. I. E-9

Category : USSR/Solid State Physics - Mechanical properties of crystal and poly- crystalline compounds

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1362

Author : Kornilov, I.I., Pryakhina, L.I.

Title : Heat Resistance of Alloys of the Quaternary System Nickel -- Chromium -- Aluminum -- Niobium.

Orig Pub : Issledovaniya po zharoprochnym splavam. M., AN SSSR, 1956, 138-147, 160 pp.

Abstract : An investigation was made of the heat resistance of alloys of the quanternary system Ni -- Cr -- Al -- Nb. The alloys were subjected to the following heat treatment: heating to 1150°, soaking for six hours, cooling in air. The heat resistance of the alloys was investigated at 800° at stresses of 6.7, 12.7, and 24.2 kg/mm^2. The maximum heat resistance is produced by those compositions of quaternary alloys corresponding to the transition region from solid solutions to alloys having a heterogeneous structure. These alloys have a structure of saturated and supersaturated solid solutions with finely dispersed segregation of the excess phase.

Card : 1/1 Inst. Metallurgy im Baykov

KORNILOV, Ivan Ivanovich; [illegible] akademik, otvetstvennyy redaktor; CHERNOV, A.N., redaktor PLYUSHCHEV, V.Ye., redaktor izdatel'stva; CHERNOV, A.N., redaktor izdatel'stva; MAKUNI, Ye.V., tekhnicheskiy redaktor

[Iron alloys] Zheleznye splavy. Moskva. Vol.3. [Iron-chromium-nickel system of alloys] Splavy sistemy zhelezo-khrom-nikel'. 1956. 430 p. (MLRA 9:9)

1. Akademiya nauk SSSR. Institut metallurgii. (Iron-chromium-nickel alloys)

Kornilov, I. I.

9-186

18-7/5

*The Strengthening of Solid Solutions of Nickel at High Temperature. I. I. Kornilov (Izvest. Akad. Nauk S.S.S.R., 1955, [Tekh.] (7), 110-120).—[In Russian]. Three dimensional diagrams were constructed showing the dependence of strength on temp. and compn. These showed the exceptionally strong influence of chem. compn. of solid soln. on the strength of the solvent, maintaining this effect at high temp. U.T.S. of pure Ni, 80 : 20 Ni-Cr, Ni-20% Cr-3% Ti, and Ni-Cr-W-Ti-Al alloys are given for 20°-900° C. These showed an increase in the U.T.S. in the given order at all temp. but a much greater % increase at high temp., illustrating the important role of the chem. bonds between different atoms in a solid soln. of metals of complicated structure, in maintaining the strengthened condition at high temp. 15 ref.—N. E. B.

Inst. Metallurgy AS USSR

KORNILOV, I. I.

9

18 19 4E2c-1

Study of a portion of the five-component system nickel-chromium-tungsten-titanium-aluminum. I. I. Kornilov, E. I. Pryakhina, and O. V. Ozhimkova. Bull. Acad. Sci. U.S.S.R., Div. Chem. Sci. 1956, 907-9 (English translation).—See C.A. 51, 3418g. B. M. R.

MT

KORNILOV, I. I.

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-chemical analysis. Phase transitions. B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29917

Author : Kornilov I. I.
Inst : not given
Title : The Significance of Physico-Chemical Analysis in Metal Chemistry

Orig Pub: Zh. neorgan. khimii, 1956, 1, No 6, 1368-1382

Abstract: Paper read at the Third All-Union Conference on Physico-Chemical Analysis (June 1955).

Inst Metallurgy AS USSR

Card : 1/1

KORNILOV, I. I.

USSR/Physical Chemistry - Thermodynamics. Thermochemistry. Equilibrium. Physico-chemical Analysis. Phase Transitions. B-8

Abst Journal: Referat Zhur - Khimiya, No 1, 1957, 365

Author: Kornilov, I. I., and Pylayeva, Ye. N.

Institution: None

Title: Investigation of the Phase Diagram of the Ternary System Ni-Ni_3Nb-Ni_3Ta

Original Periodical: Zh. neorgan. khimii, 1956, Vol 1, No 2, 308-316

Abstract: The phase diagram for the ternary system Ni(I)-Ni_3Nb(II)-Ni_3Ta(III) was studied. A phase diagram has been constructed for the binary system formed by the metallic compounds II and III, and it is shown that it represents a continuous series of solid solutions. The phase diagram for I-II-III has been investigated along 3 radial sections from the nickel corner to the quasi-binary cross section II-III. On the basis of the data obtained by thermic analysis, microstructure studies, and hardness and conductivity studies on the melts, it has

Card 1/2

KORNILOV, I.I.

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-chemical analysis. Phase transitions. B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29931

Author : Kornilov I. I., Pylayeva Ye. N., Vol'kova M. A.
Inst : Academy of Sciences USSR Inst Metallurgy im Baykov
Title : Diagram of State of Binary System Titanium - Aluminum

Orig Pub: Izv. AN SSSR, Otd. khim, n., 1956, No 7, 771-778

Abstract: Investigation of the diagram of state of Ti - Al system, by thermal, microstructure and x-ray diffraction methods, and also by means of analysis of hardness and heat-resistance. Occurence of peritectic transformations has been ascertained at 1520° (beta) + melt ⇄ gamma and at 1400° (gamma + melt ⇄ Ti Al_3) and also that of a peritectoidal reaction at 1300° (beta + gamma ⇄ alpha). Solubility of Al in Ti at 1200° and 800° is, respectively, of 26 and 21.6%. Solid solutions of Al in Ti, located near the boundary of maximum solubility of Al in Ti, have highest durability at high temperature (at 550° and 15 kg/mm^2).

Card : 1/1

KORNILOV, I. I.

18 1-4E2C

Investigation of Part of the Quinary System Nickel–Chromium–Tungsten–Titanium–Aluminium. I. I. Kornilov, L. I. Pryakhina, and O. V. Ozhimkova (*Izvest. Akad. Nauk S.S.S.R.*, 1956, [Khim.], 8), 885–896).—[In Russian]. The interaction of the five metals of the system was studied in Ni solid soln. Polythermal sections were constructed with varying Ti, W, and Al content. In the case of variable Al content, Cr, Ti, and W were maintained const. at 20, 2, and 6 and 0%, resp., it having been previously determined that alloys of the latter two sections correspond to quaternary solid soln. Tests for microstructure, hardness, sp. elect. resistance, and strength at elevated temp. were made. With the increase of Al content hardness increases from 185 to 328 kg./mm.^{2}; sp. elect. resistance within the Al content range of 0·5–2·8% increases from 1·22 to 1·35 Ω.mm.^{2}/m., reaching a max. of 1·37 Ω.mm.^{2}/m. in the 3·4–5·1% Al range. Beyond this range a sharp fall from 1·37 to 1·02 Ω.mm.^{2}/m. occurs, owing to the appearance of a second phase, in the form of coagulated particles, in alloys contg. >5% Al. Hardness and sp. elect. resistance curves show that property changes correspond to the compn. and phase changes in these alloys in the same way as in binary and ternary systems, justifying the conclusion that the method of investigation adopted here is applicable to the investigation of other multicomponent metallic systems up to dentary, and may make possible the study of new highly resistant alloys.

—Z. N. P.

NT

Kornilov, I. I.

2

3432
THE RELATION BETWEEN THE CHEMICAL COMPOSI-
TION, TEMPERATURE AND HEAT RESISTANCE. III.
QUINTUPLE SYSTEM OF Ni–Cr–W–Al–Ti ALLOY. I. I.
Kornilov and F. M. Titov. Izvest. Akad Nauk S.S.S.R.
Otdel. Tekh. Nauk No. 10, 117-22(1956) Oct. (In Russian)

Composition and polythermal diagrams plotted for Ni–
Cr–W–Al–Ti alloys in a wide range of temperatures (up
to 1250°) showed the complex relations between the heat
resistance, chemical composition, and temperature.
Transitions from one temperature to another caused quanti-
tative and qualitative changes in the composition-heat-
resistance diagrams. At lower temperatures (600 to 900°)
the saturated solid solutions in the process of slow de-
composition have a higher heat resistance than the homo-
geneous alloys. The maximum heat resistance (1000 to
1150°) was attained by alloy complexes in the transition
from maximum saturation to supersaturation of the solid
solution. (R.V.J.)

PvB

[illegible] YTK

KORNILOV, I.I.

3

3871

CHEMICAL INTERACTIONS OF TITANIUM WITH OTHER ELEMENTS. I. I. Kornilov and P. B. Budberg. Uspekhi Khim. 25, 1474-1501(1956) Dec. (In Russian)

Constitution diagrams of binary Ti alloys were reviewed to establish a scientific method of determining the optimum content for titanium alloys. To reveal the true character of various element interactions with Ti, the analysis was carried out by groups of elements according to their position in the Mendeleev periodic system in relation to Ti. (R.V.J.)

2

KORNILOV, I.I.

E-4

Category : USSR/Solid State Physics - Systems

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1155

Author : Kornilov, I.I., Panasyuk, I.D.
Inst : Institute of Metallurgy, USSR Academy of Sciences
Title : Diagrams of Composition -- Property of the Ion-Nickel System

Orig Pub : Izv. Sektora fiz. khim. analiza IONKH AN SSSR, 1956, 27, 164-170

Abstract : The diagram of state for Fe -- Ni revised on the basis of investigation results and on the basis of literature data. This diagram must include the region of formation of the Ni_3Fe compound and its solid solutions. Ni_3Fe is characterized by a single minimum on the composition vs. hardness, strength, relative elongation, and reduction of transverse cross section diagrams upon rupture, and also by a singular point on the composition-heat resistance isotherm at 450°. This singualr point vanishes on the isotherm at 800°. The boundary of the α -solid solution in the Fe -- Ni system appears at room temperature (7 -- 8% Ni) only in the form of a break on the diagram showing the composition vs. reduction in transverse area upon rapture. The boundary of the two-phase α + γ region and of the γ solid solution corresponds to 28.6% of Ni.

Card : 1/1

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-005...

KORNILOV, I.I.

Ternary and more complex solid solutions of intermetallic compounds. I. I. Kornilov. *Proc. Acad. Sci. U.S.S.R., Sect. Chem.* 106, 79-82(1956)(English translation).—See C.A. 50, 13586f. B. M. R.

Kornilov, I. I.

1747

ON SOLID SOLUTIONS OF METAL COMPOUNDS OF THREE OR MORE COMPONENTS. I. I. Kornilov (Baikov Inst. of Metallurgy). Doklady Akad. Nauk S.S.S.R. 106, 476-8(1956) Jan. 21. (In Russian)

The formation of continuous solid solutions between metallic compounds was discussed in the previous study, where it was stated that such solutions are possible only for compounds of homogeneous crystalline lattices with similar chemical bonds and atomic similarity of the elements. Among possible solid solutions are nickel compounds, aluminides, titanides, niobides, tantalides, borides, silicides, and carbides; also, the semi-conducting compounds of sulfides, selenides and arsenides. A preliminary study of triple solid solutions was made with $Ni_3Ti-Ni_3Nb-Ni_3Ta$ which after 100 hr of diffusion annealing at 1250°, became an alloy of homogeneous structure. X-ray investigations of the triple alloy showed the homogeneous system of lines of a hexagonal lattice. The microscopic and x-ray analyses showed the existence of continuous solid solutions in the triple system of $Ni_3Ti-Ni_3Nb-Ni_3Ta$ metallic compounds. Consequently, it is possible to assume formation of quadruple continuous solid solutions of $TiB_2-VB_2-NbB_2-TaB_2$; $TiSi_2-VSi_2-NbSi_2-MoSi_2$; $VC-NbC-TiC-MoC$, and others.

Phys

1/2

KORNILOV, I. I.

Category : USSR/Solid State Physics - Mechanical properties of crystals and polycrystalline compounds

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1359

Author : Kornilov, I.I.
Inst : Inst. of Metallurgy, Academy of Sciences USSR
Title : Effect of Temperature on the Softening of Metallic Alloys

Orig Pub : Dokl. AN SSSR, 1956, 106, No 5, 845-847

Abstract : Alloying of pure metals leads to a considerable softening at high temperature. The more complicated the composition of the solid solutions, the more is the strengthened state retained at high temperatures. Thus, for pure Ni and for the alloys Ni 20% Cr, Ni 20% Cr 2.5% Ti and Ni 20% Cr 6% W 20% Ti 4.5% Al, the ratio of the limiting temperature to the absolute melting temperature T_s is 0.4, 0.50, 0.65, and 0.75 respectively. The limiting temperature Tr for the alloys was arbitrarily chosen to be the temperature for which the long-term strength 100hr 15 kg/mm^2. Apparently the limiting value of T_R/T_S for the most complicated alloys is 0.75 -- 0.80. If the same holds also for the limiting temperatures under which the strengthened state is maintained in alloys based on refractory metals other then Ni, then, taking 0.6 T_s to be the temperature of the strengthened state of the alloys of pure metals, temperatures of 880°, 970°, 1340° and 1466° are obtained for

Card : 1/2

- Kornilov, I. I.

USSR / Solid State Physics / ... and Other Systems E-5

Abs Jour : Ref Zhur - Fizika, No. 5, 1957 No. 11679

Author : Kornilov, I. I., Boriskina, N. G.

Inst : Institute of Metallurgy, Academy of Sciences, USSR.

Title : Diagram of State of the Titanium-Iron System.

Orig Pub : Dokl. AN SSSR, 1956, 108, No.6, 1083 - 1085

Abstract : A study is made of the diagram of state of the Ti-Fe system by methods of thermal, dilatometric, microstructural, X-ray-structural analysis, and also by measuring the hardness and microhardness. The authors establish the existence of TiFe and $TiFe_2$ compounds with a melting temperature of approximately 1500 and 1400° respectively. Three eutectics are formed, corresponding to the crystallization of

Card: 1/2

KORNILOV, I. I.

"Heat Resistant Alloys," by I. I. Kornilov et al., Novyye Knigi Za Rubezhom, Seriya B. Tekhnika, No 1, Jan 57, pp 16-24

In a review of Utilization of Heat-Resistant Alloys, Cleveland, ASM, 1954, I. I. Kornilov states that "The translation of this book into Russian is worthwhile. It contains valuable data on heat-resistant steels and alloys which are currently produced and used in the US. These data are important for comparison with the ... heat-resistant alloys used in the USSR."

54M-1305

Kornilov, I.I.

137-58-2-4173

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 273 (USSR)

AUTHORS: Kornilov, I. I., Mikheyev, V.S.

TITLE: The High-temperature Strength of Iron-chrome-aluminum Alloy Nr 2 at 900 and 1,000°C and the Use Made of this Alloy in the Chemical Industry (Zharoprochnost' zhelezo-khromo-alyuminiyevogo splava No 2 pri 900 i 1000° i primeneniye etogo splava v khimicheskoy promyshlennosti)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 124-131

ABSTRACT: A study was made of the high-temperature strength of the Fe-Cr-Al alloy Nr 2 (GOST Kh25Yu5), used to manufacture heating resistor elements for electric furnaces and refractory sheeting and pipe. The composition of the alloy is: 23-26% Cr, 4.5-5.5% Al, 0.5% Ti, 0.08% C, 0.5% Si, $<$ 0.10% Ni, and $\leq$ 0.020% S and P. The alloy was tested in two forms, as fine-grain cold-deformed work-hardened wire and as a coarse-grain recrystallized material. Testing was done on a centrifuge at 900 and 1,000°C under stresses of 0.30 and 0.10 kg/mm^2, respectively. Test duration was 10,000 hours at 900°, 6,000 hours at 1,000°; the diameter of the test specimens was 4 mm,

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137-58-2-4173

The High-temperature Strength (cont.)

the length of the cantilever 80 mm. The variation in deflection as a function of the stress duration was taken as the criterion of the high-temperature strength. It was found that the fine-grain alloy was deformed more rapidly than the (same) coarse-grain alloy. The high rate of creep of the fine-grain alloy is attributed to the irregularity of its structure. The tests yielded data (the dependence of the ultimate stresses on the temperature) which are needed to plan products to be made of a cold-deformed alloy and able to operate under bending stresses at high temperatures. The alloy was found to be highly plastic at temperatures above 700°. Recommendations are included concerning the manufacture of coils (for heat exchangers, etc., Tr. Ed.) from pipe and casings made from sheets of this alloy, and an account is given of the use of these products in the chemical industry.

A.M.

1. Steel alloys—Applications 2. Steel alloys—Test methods 3. Steel alloys—Test results

Card 2/2

137-58-1-1575

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 1, p 212 (USSR)

AUTHORS: Kornilov, I.I., Budberg, P.B.

TITLE: Phase Diagram of the Ternary Ni-Cr-W System (Diagramma sostoyaniya troynoy sistemy Ni-Cr-W)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 132-141

ABSTRACT: An investigation of the alloys of the Ni-Cr-W system containing up to 50 percent Cr and up to 30 percent W. Sections with constant W contents of 2.5, 5, 6, 10, 15, 20, 25 and 30 percent were studied. The alloys were subjected to stepwise heat treatment in vacuum, including annealing at 1200°C for 24 hours, subsequent hardening or cooling to 1000° and holding for 100 hours, followed by hardening or annealing at 800° for 100 hours, and then hardening or cooling to room temperature during 24 hours. The investigation was conducted by the methods of micro- and x-ray structural analysis. The heat resistance of alloys was also measured by the centrifugal method; measurements of the resistivity were also made. A phase diagram of the Ni-Cr-W ternary system in the interval of percentage compositions studied was plotted. Fusibility diagrams were plotted for two pseudo-binary sections having constant W content (10 and 30 percent) and variable Cr contents.

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137-58-1-1575

Phase Diagram of the Ternary Ni-Cr-W

The crystallization temperature interval varied from 1475-1463° for 10% W and 0% Cr to 1355-1350° for 10% W and 40% Cr. For 30% W the corresponding figures are 1508-1505° for 0% Cr and 1437-1420° for 15% Cr. Polythermic sections of the system at 10 and 30% W and isothermic sections for 1200°, 1000° and 800° were plotted. The boundaries of the phase domain were determined by the microstructural method. X-ray investigations of the structures of the alloys resulted in determining the existence of a change in the period of the crystal lattice of the solid solution with Ni as base, depending on the Cr and W content. In ternary alloys containing over 40% Cr and 5.10% W, a compound with a σ phase structure was found.

L. M.

1. Nickel--Chromium--Tungsten--Alloys 2. Alloys--Annealing 3. Alloys--Hardening 4. Alloys--Heat treating methods

Card 2/2

ПОКЛИЛОВ, И.И.

137-58-3-5835

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 3, p 195 (USSR)

AUTHORS: Kornilov, I. I., Mikheyev, V. S., Chernova, T. S.

TITLE: The Ti-Cr Phase Diagram (Diagramma sostoyaniya Ti-Cr)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 126-134

ABSTRACT: The Ti-Cr phase diagram was investigated by means of thermal and microstructural analysis, as well as by measurement of its specific electrical resistivity, its temperature coefficient, and its hardness. Powder metallurgy methods were employed in the preparation of alloys composed of Ti hydride and Cr hydride; after sintering the alloys were fused in a high-frequency induction furnace. The following procedures were employed in heat treatment of specimens: 1) tempering, starting at 1200°, 1000°, 900°, and 800°C; 2) annealing with subsequent stepwise cooling as follows: exposure to 1200° for a period of 25 hours, slow cooling to 800°, at which temperature the specimen was maintained for 100 hours; this was followed by a 500 hour exposure to a temperature of 650°, whereupon the specimen was allowed to cool in the furnace. The data obtained were employed in the construction of the Ti-Cr phase diagram. The existence of an

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137-58-3-5835

137-58-4-8440

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p 303 (USSR)

AUTHORS: Kornilov, I.M., Pylayeva, Ye.N., Volkova, M.A.

TITLE: Phase and Heat Resistance Diagram of Alloys of the Ti-Al Binary System (Diagramma sostava - zharoprochnost' splavov dvoynoy sistemy Ti-Al)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 164-166

ABSTRACT: The heat resistance and change in lattice spacing of Ti in Ti-Al alloys having up to 27.5% Al is studied. The curves of the relationship between Ti lattice spacings and Al content differ in the single-phase and double-phase regions, and the values of the a and c spacings diminish as Al content rises. The centrifugal method was employed to investigate the heat resistance, tests being run at 550°C and stresses of $\sigma = 15$ kg/mm^2 for 250 hours and then at 600° and the same σ for 50 hours. The specimens were made by sintering Ti powders. The criterion of heat resistance employed was the time required to attain a given bending deflection, namely, 2 and 4 mm (the latter in the case of pure Ti). The bending deflection of alloys from the region of solid Al solutions under analysis and of alloys in the heterogen-

Phase and Heat Resistance Diagram of Alloys of the Ti-Al Binary System

eous region ($\alpha + \gamma$) rises rapidly in the process of deformation. As the concentration of Al in the solid solution rises, the bending deflection diminishes sharply (alloys with 2.5-5% Al bend 6 mm after 250 hours, while those with 7.5-20% Al bend 2-3 mm). Alloys in the biphasic region are brittle and less heat resistant than Ti and alloys from the region of solid solutions. Comparison of the curves of bending deflection for various alloys with the phase diagram and with the change in the lattice spacing shows that in the Ti-Al binary system a definite relationship exists at 550-600° between the heat resistance, the composition, and the structure of the alloys: heat resistance exists within the bounds of a limited solid-solution range of Al content. Maximum heat resistance is observed in high-content solid Ti solutions. The compositions of alloys in the transition zone from solid solutions to the biphasic region show higher heat resistance than pure Ti, the solid solutions studied, or alloys unmistakably in the biphasic region.

V.G.

1. Aluminum-titanium alloys--Phase studies 2. Aluminum-titanium alloys --Temperature factors

KORNILOV, F.I. 137-58-2-3910

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 233 (USSR)

AUTHORS: Kornilov, I. I., Polyakova, R.S.

TITLE: An Investigation of the Nb-Mo System (Issledovaniye sistemy Nb-Mo)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 149-153

ABSTRACT: Specimens were prepared from powdered Nb (98.7%) and Mo (99.9%) by compacting briquettes and sintering or fusing them. From the data of thermic analysis (determination of the temperature of the solidus and recording of heating curves), a study was made of microstructure, microhardness, specific gravity, electrical resistance, and its temperature coefficient. A diagram of the fusibility of the Nb-Mo system was plotted showing crystallization of a continuous series of solid solutions with a flat minimum in the 20-30% Mo interval.

R.M.

1. Molybdenum--niobium systems--Properties

Card 1/1

KORNILOV, I. I.

13

1-4E2c

1-4E3d

14 27 18

Solubility of titanium and phase composition of alloys in the quintuple system Ni–Cr–W–Al–Ti. I. I. Kornilov, A. Ya. Snetkov, and E. M. Titov. Zhur. Neorg. Khim. 2, 155-6(1957).—Thermal, metallographic, and x-ray study shows that the soly. of Ti at const. compns. of Cr, W, and Al is not more than 1% at 800–1000°. Further increase in temp. improves the soly.: 2% at 1100° and approx. 5% at 1200°. X-ray analysis of ppts. from the alloys contg. 3.25, 5.0, and 8.2% Ti after heating for 10 hrs. at 1130°, shows that they contain 2 phases; one is a known phase γ' and another has a body-centered lattice. The latter phase is probably a solid soln. of W. Its presence can be explained by a nonequil. state of the alloys studied. With an increase in Ti content in the heterophased alloy the lattice period of the solid soln. of Ni and γ' phase is increased, while that of W phase is decreased. This change is due to a difference in distribution of the elements in the phases. In an alloy of 9.4% Ti, after heating for 10 hrs. at 1130°, a phase Ni_3Ti is found. There is also present a stable phase γ' which is a solid soln. of Ni_3Al.

A. Libackyj

MT

Chair Aviation Materials
Military Air Eng. Acad im N. Ye Zhukovskiy

KORNILOV, I. I.

3

4E2c

Chemical stability of metals and metal alloys. 18 I. I. Kornilov. *Khim. Nauka i Prom.* 2, 238-48(1957).—The stability of metals and alloys to aggressive media and high temp. is discussed. The compns. are tabulated and isolated on compn. diagrams. 18

L. Berenowitz

FCB

-28-

Card : 1/2

KORNILOV, N. N.

USSR/Physical Chemistry - Thermodynamics, Thermochemistry, Equilibria, Physical-Chemical Analysis, Phase Transitions. B-8

Abs Jour : Referat Zhur - Khimiya, No 1, 1958, 392

Author : N.N. Kornilov, N.M. Matveyeva.

Inst : -

Title : Transformation Speed of α-Solid Solution into δ-Phase in System Fe - Cr - V.

Orig Pub : Zh. neorgan. khimii, 1957, 2, No 6, 1383-1391

Abstract : The phase composition of the ternary system iron - chromium - vanadium at 700° was studied by the method of measuring the transformation speed. The transformation speed of an α-solid solution into the δ-phase was determined from the data of the change of the magnetic saturation of alloys tempered at 1350° during their annealing at 700°. Alloys situated on the section FeCr - FeV and on the three angle sections with the ratios of Cr to V of 1 : 3, 1 : 1 and 3 : 1 were studied. The formation speed of δ-solid

Card 1/2

USSR/Physical Chemistry - Thermodynamics, Thermochemistry, Equilibria, Physical-Chemical Analysis, Phase Transitions. B-8

Abs Jour : Ref Zhur - Khimiya, No 1, 1958, 392

solutions from α-solutions of the compounds FeCr and FeV is the maximum in case of alloys, the composition fo which is close to the composition of FeV, and the minimum formation speed is in case of alloys close to FeCr. The phase composition of ternary alloys was determined for alloys on angle sections basing on the curves magnetic saturation - time and composition - time of transformation of a half. The boundaries of phase regions at 700° coincide with boundaries established by other methods of physical-chemical analysis.

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AUTHORS: Kornilov, I.I. and Matveeva, N.M. 571

TITLE: Phase Transformation in the System Iron - Chromium- Vanadium. (Fazovye Prevrashcheniya v Sisteme Zhelezo - Khrom - Vanadiy).

PERIODICAL: "Zhurnal Neorganicheskoy Khimii" (Journal of Inorganic Chemistry, Vol.II, No.2, pp.355-366. (U.S.S.R.).1957

ABSTRACT: Because of the insufficient amount of experimental material on alloys of iron with chromium and vanadium there is a clear need for a detailed study of phase transformations in the system, associated with the formation of solid solutions of the metallic compounds FeCr and FeV. The present work was undertaken with this aim in view and also with that of finding the ranges for the existence of these compounds. The alloys corresponding to four sections of the ternary system were studied. Differential thermal analysis, hardness, electrical resistivity, micro-structural and X-ray structural analysis were used. At high temperatures the alloys of iron with chromium and vanadium are ternary ferritic solid solutions in the hardened state. On annealing or slow cooling the ferritic solid solutions undergo a $\sigma \rightarrow \alpha$ transformation. The formation of the σ-phase is expressed in the loss by the alloys of ferromagnetic properties and increase in hardness and brittleness. The temperature of this transformation was determined by differential thermal analysis. For alloys of the section corresponding to 50 atomic % iron it rises evenly and continuously from the compound FeCr (868°C) to the compound FeC (1225°C). This indicates the

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Phase Transformation in the System Iron - Chromium - Vanadium. (Cont.)

extends in the ternary system in the form of a tunnel-like shape from the binary system iron - chromium to the binary system iron - vanadium.

There are 9 references, 6 of them Russian.

Ref.3: I.I.Kornilov, Zhelezne Splavi, Vol.2, published by the Academy of Sciences of the USSR, 1951. Received 8 October, 1956.

15 Figures and 3 Tables.

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KORNILOV, I.I.; VLASOV, V.S.

Fusibility diagram of the system titanium --vanadium -- niobium. Zhur. neorg. khim. 2 no.12:2762-2765 D '57. (MIRA 11:2)
(Titanium) (Vanadium) (Niobium)

KORNILOV, I. I.

24-9-8/33

AUTHORS: Kornilov, I. I. and Shinyayev, A. Ya. (Moscow)

TITLE: On the relation between diffusion and heat resistance in alloys of the nickel system. (O svyazi mezhdu diffuziyey i zharoprochnost'yu v splavakh nikelevykh sistem).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1957, No.9, pp. 50-55 (USSR)

ABSTRACT: Measurement of the activation energy of the diffusion process is one of the methods of determining the energy of the bonds of the atoms in the crystal lattice of metals (Ref.5). In this paper some results are described of investigations based on physico-chemical conceptions of the relations between diffusion and heat resistance in alloys. The following systems of heat resistant alloys were investigated: binary (Ni-Ti), ternary (Ni-Ti-Cr) and quinary (Ni-Ti-Cr-W-Al); the alloys were prepared by L. I. Pryakhina. These systems were the subject of earlier investigations by one of the authors and his team (Refs. 2-4); it was shown in these papers that the heat resistance of alloys increased gradually with increase of the number of components. To avoid the influence of over-saturation of alloys by alloying additions, saturated solid solutions of the above mentioned systems were chosen;

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On the relation between diffusion and heat resistance in alloys of the nickel system.

between 920 and 1250°C for diffusion times varying between 500 and four hours. Figs. 1 and 2 give the results relating to the specific activity α of the radio-active atoms of each of the removed layers as a function of the square of the distance of these layers from the specimen surface for 960 and 1218°C. The change in the diffusion coefficient on transition from the binary alloy to the ternary and quinary alloys at various temperatures is plotted in Fig.3. The graph, Fig.4, gives the temperature dependence of the coefficient of spatial diffusion of the iron in the investigated alloys. From the inclination angle of the experimental straight lines, given in Fig.4, the activation energy and the magnitude of the pre-exponential factor for the investigated alloys is entered in Table 1, p.53. Table 2 gives the high temperature strength of the investigated alloys in the range 1050 to 1330°C. It was found that the diffusion coefficients have the highest values for a binary alloy. At temperatures up to 1100°C the value of the diffusion coefficient is lowest for the quinary alloy but for temperatures above 1100°C the diffusion coefficient of

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R00082472000

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On the relation between diffusion and heat resistance in alloys of the nickel system.

quinary alloys is equal to that of ternary alloys and at even higher temperatures, of the order of 1200 to 1250°C, it becomes higher than the diffusion coefficient in the ternary alloy. The activation energy, calculated on the basis of the experimental data, amounted respectively to 73.1, 84.0 and 91.3 kcal/g-atom for the binary, ternary and quinary alloys of the nickel system. There are 4 figures, 2 tables and 10 references, all of which are Slavic.

SUBMITTED: April 29, 1956.

AVAILABLE: Library of Congress.

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KORNILOV, I. I.

24-10-5/26

AUTHORS: Domotenko, N. I. and Kornilov, I. I. (Moscow)

TITLE: Heat resistance and hardness in the hot state of alloys of the system Ni-Cr. (Zharoprochnost' i goryachaya tverdost' splavov sistemy nikel'-khrom).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1957, No.10, pp. 36-40 (USSR)

ABSTRACT: In earlier work of one of the authors and his team (Refs.1-3), it was established that within a certain temperature range those alloys will have the highest heat resistance the composition of which corresponds to the transient range and are in a state of finely dispersed decomposition. In the earlier work the tests were carried out (for a given temperature) with a single stress value which was usually reduced with increasing temperature. The influence of the stresses on the heat resistance of the alloy was not investigated. In this paper the influence on the position of the maximum heat resistance was studied for the alloys of the system Ni-Cr of the following factors: change in the stresses at a constant test temperature; change of the test temperature under the condition that during the transition to higher temperatures the initial stresses remain constant. For

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Heat resistance and hardness in the hot state of alloys of the system Ni-Cr.

this purpose alloys were prepared with various Cr contents, between 5 and 50% with steps of 5% each. The smelting was carried out in a high frequency furnace inside corundum crucibles under a layer of basic slag. The specimens for testing by the centrifugal method were obtained by sucking the melt into a preheated porcelain tube; before the tests the alloys were homogenised in an argon atmosphere at 1150°C for six hours and then slowly cooled, together with the furnace. The heat resistance was tested at 800°C, with loading values of 8, 10, 12.3, 14.3 and 15.8 kg/mm² and with a constant loading of 10 kg/mm² at the temperatures 700, 800, 850 and 900°C. The obtained data on the sag of the specimens as a function of the duration of loading for given initial loading values were utilised for determining the characteristic of the processes of creep of the alloys and for plotting the diagram composition-heat resistance. It was found that alloys containing between 5 and 25% Cr have a considerably higher creep speed than other alloys, therefore, the further tests were carried out with alloys containing between 30 and 50% Cr. The results obtained

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Heat resistance and hardness in the hot state of alloys of the system Ni-Cr.

are plotted in the graphs, Figs.1-4. It was established that changes in the loading have an appreciable influence on the position of the maximum on the diagrams composition-heat resistance and conservation of the constancy of the stresses with increasing testing temperatures leads to a blurring of this maximum. In para.2 the results are discussed of the relation between the heat resistance (determined by means of the centrifugal method) and the hardness in the hot state in the temperature range 800 to 1100°C. The heat resistance of the alloys was studied at 800, 1000 and 1100°C for stresses of 10, 2.7 and 2.15 kg/mm^2 respectively; the hardness was studied on specimens containing 25, 30, 33.1, 35.5, 40, 43.5, 47.3 and 50% Cr. Analysis of the results indicates that increase in the temperature from 800 to 1100°C brings about a displacement of the maximum heat resistance into the range of non-saturated solid solutions; at 1100°C the most heat resistant alloys are those containing 38 to 40% Cr, whilst the limit solubility of Cr in nickel at this temperature is 44%. An increase in the Cr concentration in the solid solution of Ni leads to an increase of the hot

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KORNILOV, I.I., doktor khimicheskikh nauk.

Chemistry of metals and its imminent problems. Vest. AN SSSR 27 no.6:33-43 Je '57. (MIRA 10:7)

(Metals)

where he had a scientific consultation with the ...
nezovskiy and Sedlachek. The experience of his foreign colleagues

Card 1/2

Conference on the Phase Transformation of Metals. 30-9-13/48

in the field of aluminum-metallurgy also were of special interest for the author.
There is 1 figure.

AVAILABLE: Library of Congress.

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[illegible] I. I.

[illegible] nickel alloys [illegible]

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000824720007-1

20-1-29/64

Mathematical Table of Chemical Elements.

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

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KORNILOV, I.I.

18(2) PHASE I BOOK EXPLOITATION SOV/1200

Akademiya nauk SSSR. Institut metallurgii

Titan i yego splavy; metallurgiya i metallovedeniye (Titanium and Its Alloys; Metallurgy and Physical Metallurgy) Moscow, Izd-vo AN SSSR, 1958. 209 p. 4,000 copies printed.

Resp. Ed.: Ageyev, N.V., Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: Rzheznikov, V.S.; Tech. Ed.: Kiseleva, A.A.

PURPOSE: This book is intended for metallurgists, machine designers, and scientific and industrial personnel working on the development of titanium as an industrial metal.

COVERAGE: The book deals with the following: methods of welding and soldering commercial titanium; mechanical properties of titanium weldments; crystal growth and structural changes occuring during welding; recrystallization diagrams of titanium and its alloys; a metallographic method of determining the degree of contamination of titanium and its alloys by oxygen and nitrogen; plasticity of titanium alloys; industrial methods of rolling titanium and

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PART I. PHYSICAL METALLURGY

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Titanium and Its Alloys (Cont.) SOV/1200

Titanium and Its Alloys (Cont.) SOV/1200

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PART III. Welding of Titanium

AVAILABLE: Library of Congress

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2-21-59

PHASE I BOOK EXPLOITATION 1025

Kornilov, Ivan Ivanovich

Nikel' i yego splavy (Nickel and Its Alloys), Moscow, Izd-vo AN SSSR, 1958. 338 p. 4,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii.

Resp. Ed.: Ageyev, N.V., Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: Rzheznikov, V.S.; Tech. Ed.: Makuni, Ye. V.

PURPOSE: To provide information to metallurgists and other scientific workers and to metallurgical engineers on the origin, deposits, production, and applications of nickel.

COVERAGE: The author discusses nickel from various viewpoints, including the history of its discovery, applications, the development of production, and prospective future applications. The most recent

Nickel and Its Alloys 1025

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KORNILOV, I.I.

18(0) PHASE I BOOK EXPLOITATION SOV/1728

Akademiya nauk SSSR. Institut metallurgii

Sovremennyye problemy metallurgii (Modern Problems in Metallurgy) Moscow, Izd-vo AN SSSR, 1958. 640 p. 3,000 copies printed.

Resp. Ed.: A.N. Samarin, Corresponding Member, USSR Academy of Sciences; Eds. of Publishing House: V.S. Rzhevaikov, and A.N. Bernov; Tech. Ed.: T.V. Polyakova.

PURPOSE: This book is intended for scientific and technical personnel in the field of metallurgy.

COVERAGE: This is a collection of articles on certain aspects of Soviet metallurgy. The book is dedicated to Academician Ivan Pavlovich Bardin on the occasion of his 75th birthday. The book is divided into seven parts. The first part consists of two articles presenting a brief account of the biography and professional activity of the Soviet metallurgist. It includes an article by John Chipman, Nicholas Grant, and John Elliott (M.I.T., USA) describing their meeting with Bardin in Moscow and also his visit to the United States. The second part consists of three articles and deals with raw materials and fuels for the Soviet metallurgical industry. The third part represents the major portion of the book. It consists of 25 articles dealing with the various aspects of the metallurgy of pig iron and steel. The fourth part consists of two articles treating the metallurgy of nonferrous metals. The fifth part consists of three articles on the forming of metals. The sixth part consists of eight articles discussing certain aspects of physical metallurgy. The last part deals with general problems in the field of metallurgy. References are given after each article. No personalities are mentioned.

TABLE OF CONTENTS:

Modern Problems in Metallurgy SOV/1728

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KORNILOV, I.I.; BUDBERG, P.B.; VOLKOVA, M.A.; PROKHANOV, V.F.; PYLAYEVA, Ye.N.

Developing a method of hot pressing of titanium and titanium alloy powders. Titan i ego splavy no. 1:25-32 '58. (MIRA 14:5)

1. Institut metallurgii AN SSSR.
(Titanium—Metallurgy) (Powder metallurgy)

KORNILOV, I. I.

24-58-3-38/38

AUTHOR: Solomonov, M.

TITLE: Conference on Shaping and Treatment of Heat-resistant Materials (Soveshchaniye po obrabotke zharoprochnykh materialov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 3, pp 175-176 (USSR)

ABSTRACT: Institut mashinovedeniya and Komissiya po tekhnologii mashinostroyeniya Ak.nauk SSSR (The Institute of Mechanical Engineering and the Commission on Engineering Technology, Academy of Sciences USSR), convened a conference held December 18-21, 1957. Over 300 delegates representing research establishments, design organizations and higher teaching establishments from various parts of the Soviet Union participated. In the plenary meeting the following papers were read: "Properties of heat-resistant alloys", by I. I. Kornilov and "The role of heat-resistant materials and the demands to be made by such materials in steam and gas turbine construction" by V. V. Uvarov. The main work was carried out in sectional meetings where over 35 papers were read. In the section on casting processes the following papers were read: "Crystallization and structure of ingots of high

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Conference on Shaping and Treatment of Heat-resistant Materials.

temperature austenitic steels" (A.A.Popov, V.A.Mirmel'shteyn); "Improving the heat resistance of iron-nickel base heat resisting alloys" (A.S. Stroyev and E.L. Zarubina); "Low stability stainless ageing steels of the transient austenitic class and their heat treatment" (V.V. Sochkov); "Smelting of heat-resistant alloys of the type ZhS and problems of utilising cut-offs, etc." (K. Ya. Shpuit); "On new methods of studying the microstructure and the properties of heat-resistant alloys at elevated temperatures" (M. G. Lozinskiy); "Influence of supersonics on the properties of alloys" (G.I.Pogodin-Alekseyev and V.V. Zaboleyev-Zopov); "Cast gas turbine runner blades " (F. V. Aksenov); "Features of precision (lost wax) casting of components made of heat-resistant alloys"(B. S. Kurchman).

At the section on shaping by applying pressure the following papers were read: "Thermomechanical regime of shaping of high melting point heat-resistant molybdenum and chromium base alloys" (N.I. Korneyev, A.G. Skubarev, L.E. Pevzner); "Methods of mechanical work hardening of components of heat-resistant alloys"(I.V. Kudryavtsev, B.I. Aleksandrov); "Stamping and drawing of components made of heat resistant sheet metal, using cooling to a very low temperature" (V. N. Revinov);

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Conference on Shaping and Treatment of Heat-resistant Materials.

"Upsetting of standards made of heat-resistant steels" (I. S. Petrov); "Producing accurate blanks of steel blades of compressors by the deformation method" (M.Ya. Kuleshov); "Producing blanks of turbine blades of heat-resistant alloys with minimum tolerance "along the stylus" (E.M. Eyfir); "Features of hot stamping of titanium alloys" (L.A.Nikol'skiy). In the section on welding processes the following papers were read: "Welding of power generation components made of austenitic heat-resistant steel" (K.V. Lyubovskiy); "Welding of temperature resistant steels for high parameter power generation equipment" (L.M. Yarovinskiy); "Welding of heat resistant steels and alloys" (M.A. Lyustrov); "Automatic welding of high temperature alloys"(B.I. Medovar); "Arc welding in a protective gas medium of heat-resistant alloys" (B.M. Pronina); "Welding of components of turbines made of heat-resistant alloys" (G.A. Nikolayev); "Tendency to forming hot cracks of the metal-weld joint in manual and automatic arc welding of austenitic steel and nickel alloys" (V.S. Sedykh); "Argon-arc welding of titanium components" (D.A. Polyakov); "Spot and "roller" (seam) welding of titanium alloy components" (P.L. Chuloshnikov).

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Conference on Shaping and Treatment of Heat-resistant Materials.

In the section on machining the following papers were read: "Basic trends and results of investigations on high efficiency machining of components made of heat resistant alloys" (A. I. Isayev); "Investigation of the machinability of deformed heat-resistant alloys"(V.A. Krivoukhov); "Machinability of heat-resistant steels and alloys in turning, milling and drilling with carbide tipped tools" (N.I. Reznikov); "Influence of various factors on the machinability of heat-resistant alloys" (K. F. Romanov); "Machinability of stainless steels" (S.S. Mozhayev); "Machining of titanium alloys" (A.D. Vershinskaya); "Broaching of heat-resistant alloys" (F.N.Pronkin); "Influence of certain factors on the dimensional stability of the cutting tool in turning the heat-resistant alloy EI-617" (A.S. Kurochkin); "Influence of the machining on the strength properties of heat-resistant alloys" (K.F.Romanov, N.G. Grinchenko); "Temperature field in the components and tools in machining heat-resistant alloys in steels" (A.N. Reznikov); "Grindability of heat-resistant alloys". (B.D. Sileverstov);

The papers and communications by delegates from a number of works have shown that a large number of heat-resistant alloys have been developed which have useful properties from

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Conference on Shaping and Treatment of Heat-resistant Materials. 24-58-3-38/38

the engineering point of view but the shaping of these alloys causes considerable difficulty. Due to the low ductility of heat-resistant alloys, the problem of searching for the most favourable thermomechanical regimes is still very acute. Much successful work has been carried out in the Soviet Union on welding austenitic heat-resistant alloys. Electrodes have been developed for welding steels at 600-650°C. Welding is being applied to steam pipings and fittings, high pressure cylinders of steam turbines of very high ratings, rotors and cylinders of gas turbines, etc. Numerous phenomena have been successfully studied which play an important role in obtaining faultless welds, automatic welding has been studied of certain elements of structures of large cross-sections, ensuring the formation of a predetermined quantity of the ferritic phase. The Institut elektrosvarki im. akademika Ye. O.Paton (Electric Welding Institute im. Ye.O. Paton) has carried out a considerable amount of work on automation of welding of heat-resistant austenitic steels and nickel base alloys which showed that, in addition to welding under a flux, welding in a CO_2 atmosphere can also be usefully applied. The

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Conference on Shaping and Treatment of Heat-resistant Materials.

work of NIAT on welding of steels EI-602 and EI-703 and the technology of manufacturing welded structures from thin sheet steels of these grades was also mentioned. VIM has mastered the technology of welding and shaping by pressure of various heat resistant alloys, including high melting point alloys. A number of works on improving the study of formation of hot cracks during welding and also on investigating the austenitic and other weld joints are being carried out at the Institut metallurgii im. A. A. Baykov AN .SSSR (Institute of Metallurgy, im. A. A. Baykov, Academy of Sciences USSR). Investigations were carried out on welding austenitic and martensitic steels and the technology of welding turbine assemblies has been mastered at the MVTU im Bauman, whilst LPI im Kalinin has investigated the welding of austenitic steels and components of turbines. Some deficiencies in the work of individual undertakings and research institutes were criticised and methods of improving the shaping and treatment of heat resistant alloys were outlined.

Card 6/6

1. Mechanical engineering--Conference--USSR

KORNILOV, I.I.; DOMOTENKO, N.T.

Heat resistance and hot hardness of nickel - chromium, molybdenum-tungsten binary system alloys. Issl. po zharopr. splav. 3:304-401 '58. (MIRA 11:11)

(Heat resistant alloys) (Nickel-chromium alloys--Testing)
(Molybdenum-tungsten alloys--Testing)

KORNILOV, I.I.

AUTHOR: Kornilov, I. I.

78-2-17/43

TITLE: I. The Interaction of Titanium With Elements of the Periodic System (I. Vzaimodeystviye titana s elementami periodicheskoy sistemy)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 2, pp. 360-365 (USSR)

ABSTRACT: On the basis of the chemical influence exerted by titanium upon the elements of the periodic system they may be divided into four groups:
1. Elements which do not react with titanium: Li, Na, K, Rb, Cs, Fr, Mg, Ca, Sr, Ba, Ra. The rare gases also belong to this group: Ne, Ar, Kr, Xe, Rn;
2. Elements which form chemical compounds with ion- or covalent-linkages with titanium: H, F, Cl, Br, J, At, O, S, Se, Te and Po as well as elements which possess none or limited solubility in titanium;
3. Elements which form compounds with a metallic nature and limited solid solutions. This group contains most elements, namely: Cu, Ag, Au, Zn, Cd, Hg, Be, Ga, In, Tl, B, Al, Th, C, Si, Ge, Sn, Pb, N, P, As, Sb, Mn, Tc, Re, Fe, Co, Ni, Ru, Rh,

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Pd, Os, Ir, Pt;
4. Elements which form solid solutions with the -modification: Zr, Hf, V, Nb, Ta, Cr, Mo, U, W (must again be checked), Sk.
The influence exerted by titanium upon other elements yields the possibility to explain the geochemical, metallurgical and technological properties of titanium and its alloys. By this knowledge the occurence of titanium in nature in defferent minerals as isomorphous mixtures may be explained. The reactions of titanium with other elements of the periodic system indicate the way for the production of titanium metal from various titanium compounds and smooth the scientific ways for the treatment of titanium alloys. The inclination toward the formation of simple and complicated oxygen- and halogen--compounds of titanium explains the wide distribution of titanium in nature as oxygen-containing compound and makes possible the synthesis of various halogen compounds of titanium. The absence of the reaction of titanium to alkali metals permits the technology for the production of purest titanium metal by magnesium, sodium and calcium from its oxygen- or halogen-compounds. As the rare gases do not react with

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I. The Interaction of Titanium With Elements of the Periodic System 78-2-17/43

titanium, they are used as protective gas atmosphere in the production of titanium metal.
There are 1 figure, 3 tables, and 9 Slavic references.

ASSOCIATION: Metallurgical Institute AS USSR imeni A. A. Baykov (Institut metallurgii im. A.A. Baykova Akademii nauk SSSR)

SUBMITTED: April 29, 1957

AVAILABLE: Library of Congress

Card 3/3

AUTHOR: Kornilov, I. I.

78-3-3-4/47

TITLE: Concerning the Problem on the Theory of the Phase Diagrams of Polycomponent Systems (K voprosu o teorii diagramm sostoyaniya mnogokomponentnykh sistem)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 571-584 (USSR)

ABSTRACT: The development of the physico-chemical analysis of polycomponent metallic systems, its theoretical and practical importance were treated. In the investigation of these systems it is necessary to start from chemical reactions in polycomponent systems. The peculiarities of the metallo-chemical reactions were treated. They lead to the formation of metallic solid solutions and compounds. It was shown that the metallic compounds are also inclined to the formation of solid solutions with metals and among each other. The large class of the solid solutions of metallic compounds was given the name "metallide solid solutions". By investigations of the peculiarities of the formation of metallic solid solu-

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Concerning the Problem on the Theory of the Phase Diagrams of Polycomponent Systems 78-3-3-4/47

tions it was shown that in polycomponent systems with n-components in the solid solutions the following equilibria occur: between a polycomponent liquid solution and a polycomponent solid solution. The possibility of the formation of polycomponent solid solutions of nickel with 4, 15 and 16 components was determined. Based on the peculiarity of the formation of metallidesolid solutions and metallic solid solutions it was shown that the investigations in the polycomponent systems are to be interpreted as reactions among three phases, between a polycomponent liquid solution, a metallic solid solution and a metallide solid solution. Based on the thermodynamic calculations compounds or their solid solutions in the polycomponent systems were determined. On the basis of the theory on the heterogeneous equilibrium and the phase theory the factors determining the equilibrium in polycomponent metallic systems were determined: 1) The number of metallic phases r in systems with n-components can change from 1 to n, or generally expressed in $r \leqslant n$. 2) By an increase in the number of components forming the solid solutions the phase number becomes smaller than the number of components. 3) By the number of the formation of metallic compounds in polycomponent systems the number of components

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Concerning the Problem on the Theory of the Phase Diagrams of Polycomponent Systems 78-3-3-4/47

becomes smaller than the number of chemical elements occurring in the system. There are 12 figures, 1 table, and 25 references, 20 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Metallurgical Institute imeni A. A. Baykov, AS USSR)

SUBMITTED: June 25, 1957

Card 3/3

AUTHOR: Kornilov, I. I.

78-3-3-12/47

TITLE: Discussion on Lectures (Obsuzhdeniye dokladov)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 606-606 (USSR)

ABSTRACT: I. I. Kornilov's answer to B. Ya. Pines' discussion: The aim of his informations had been to show the possibilities of bringing the solution of polycomponent systems to 2-, 3- and 4-component systems in cases where solid solutions and conjugated systems with 2-, 3- and 4-phases form. As there is a great number of degrees of freedom present a restricted (2; 3; 4;) number of phases can be obtained. Therefore it is possible to change the concentration and the number of components of such solid solutions. The lecturer regards it possible to denote the diagrams of these 6-8 component systems as phase diagrams. Here as well as in normal 3-4-component systems it is possible to make a triangulation and to separate bindings and phases of secondary systems based on them. Thus the secondary system containing all 6, 8 and 10 elements and yet being in equilibrium is separated as single 2- and 3-phase system. These systems include 6, 8

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Inst. Metallurgy im. A. A. Baykov

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and 10 components which act in them not as single constituents but as a limited number of phases. These latter are formed between the solid metal solution and the solid solutions of metal alloys. The 7-component system serves as example where there exists equilibrium between these 7 components in any interaction of the components. 3 conjugated phases - solid solutions on the basis of nickel are formed. Ni_3Ti and Ni_3Al - these two phases were separated. From this point of view the speaker does not see any contradiction in the representation and in the propagation of the idea of constructing such a diagram for the polycomponent system, as well as in its use for the investigation of the equilibrium between the limited number of phases in these systems.

The speaker then discussed the explanations by V. I. Mikheyeva and said that they had touched very important and actual problems with respect to the reorganization of phase diagram investigation. He fully supports her appeal. Also V.N. Sveshnikov's (AS Ukrainian SSR) lecture had satisfied him in which the lecturer had expressed his desire better to coordinate research in the field of the phase diagrams of metal systems.

Card 2/3

AUTHORS: Kornilov, I. I., Pylayeva, Ye. N. 78-3-3-22/47

TITLE: Investigations of the Binary Systems Ni_3Ti-Ni_3Ta and Ni_3Ti-Ni_3Nb (Issledovaniye dvoynykh sistem Ni_3Ti-Ni_3Ta i Ni_3Ti-Ni_3Nb) The Binary System Ni_3Ti-Ni_3Ta (Dvoynaya sistema Ni_3Ti-Ni_3Ta)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 673-677 (USSR)

ABSTRACT: In the present work the phase diagrams of the binary systems Ni_3Ti-Ni_3Ta and Ni_3Ti-Ni_3Nb were investigated. The phase diagrams of the binary systems between metallic compounds were determined by thermal analysis, microstructure analysis as well as investigations of the electric resistance, the hardness and the specific weight. On the basis of these investigations the phase diagrams were constructed. The compound Ni_3Ti crystallizes at 1375°C and the compound Ni_3Ta at 1531°C. The temperature of the crystallization of the alloys in the

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78-3-3-22/47

Investigations of the Binary Systems Ni_3Ti-Ni_3Ta and Ni_3Ti-Ni_3Nb. The Binary System Ni_3Ti-Ni_3Ta

system Ni_3Ti-Ni_3Ta is lower than in pure compounds. The fusion diagram in the system Ni_3Ti-Ni_3Ta represents an uninterrupted series of solid solutions between the compounds and the minimum crystallization temperature lies at 30 % Ni_3Ta. The microstructure of the alloy in the state of equilibrium (after 200 hours treatment at 1200°C) shows polyhedral crystals. The fusion diagram of the system Ni_3Nb-Ni_3Ti is based on the thermal analysis, the determination of the microstructure, the hardness, the electric resistance and the specific weight of the alloys. The melting point of the compound Ni_3Nb lies at 1410°C. By addition of Ni_3Ti to the compound Ni_3Nb at 70 % Ni_3Ti the minimum of the melting point is 1285°C. There are 3 figures, 2 tables, and 11 references, 9 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova, Akademii nauk SSSR (Metallurgical Institute imeni A. A. Baykov, AS USSR)

SUBMITTED: June 25, 1957

Card 2/2

AUTHORS: Kornilov, I. I., Mints, R. S. 78-3 3-28/47

TITLE: An Investigation of the System Ni-Cr-NiAl (Issledovaniye sistemy Ni-Cr-NiAl)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 699-707 (USSR)

ABSTRACT: The system Ni-Cr-NiAl was investigated on the basis of the examination of the binary systems Ni-NiAl, Ni-Cr and Cr-NiAl. In the system Ni-NiAl solid solutions and the compound Ni_3Al form. An increase of the aluminum content increases the hardness. With the entrance of the compound Ni_3Al the hardness of the alloy is diminished. Solid solutions and Ni_3Cr occur in the system Ni-Cr as well. In the system Cr-NiAl the eutectic lies at 1445°C and the chromium content is 38 %. By addition of NiAl to chromium the hardness and the electric resistance of the alloys in the domain of solid solutions increase. Alloys containing 80 - 90 % chromium have the highest density. The alloys with 80 % chromium have a hardness like steel. The present investiations comprise the investigations of the proper-

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ties of the alloys in the domain of solid solutions in the ternary system Ni-Cr-NiAl. With the produced alloys the following determinations were performed: microstructure, hardness, electric resistance, temperature coefficient of the electric resistance after the hardening at 1200°C, coefficient of thermal expansion, resistance to heat. In the section with 5 - 10 % chromium phases of homogeneous solid solutions and the compound Ni_3Al γ' occur by an increase of the NiAl content. On further addition of NiAl the phase γ' and at the end an homogeneous solid solution of β occur. The hardness of the alloys in the system Ni-Cr-NiAl with 5, 10, 15 and 20 % chromium was investigated. The hardness in the alloys with 5 % chromium increases with increasing NiAl-content to 25 %, passes a minimum at 35 % NiAl and then further increases. The electric resistance and the temperature coefficient of the electric resistance were determined at 25 and 100°C. The entrance of the phase Ni_3Al was not only determined by the analyses of hardness and microstructure. There are 11 figures, 2 tables, and 14 references, 6 of which are Soviet.

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78 -3-3-29/47

AUTHORS: Kornilov, I. I., Pryakhina, L. I., Ozhimkova, O. V., Snetkov, A. Ya.

TITLE: The Interaction of Titanium Carbide With Six-Component Solid Solutions of Nickel (Vzaimodeystviye karbida titana s shesti-komponentnym nikelevym tverdym rastvorom)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 708-716 (USSR)

ABSTRACT: The chemical interaction of titanium carbide with six-component solid solutions of nickel and the equilibrium between phases in these complicated systems were investigated. In the alloys with 9,3% titanium carbide an eutectic forms. At the eutectic temperature of 1280°C the solubility of titanium carbide in nickel amounts to 6,2 % at 700°C the solubility drops to 2 %. With the produced alloys the following investigations were performed: thermographic, metallographic and radiographic analyses as well as the hardness determination of the alloys. The alloys of the solid nickel solutions with titanium carbide are of eutectic nature and crystallize similar to the alloys

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78-3-3-29/47

The Interaction of Titanium Carbide With Six-Component Solid Solutions of Nickel

of the system Ni-TiC. At 1300°C the solubility of titanium carbide in the solid nickel solutions is 1,9 %. With a decrease of temperature the solubility of titanium carbide decreases, at 1250°C it is 1,4 %, at 1200°C - 0,55 %, at 1000°C 0,15 %. In the alloys with 50 % titanium carbide large crystals of titanium carbide which are encluded by an eutectic-composition occur after hardening at 1300°C. Samples hardened at higher temperatures have an higher hardness. In alloys of the above-mentioned system two phases were determined by the X-ray structural and microstructural investigation, as well as by selective solubility: an γ-phase of solid nickel solution with a boundary-centered cubic system and a phase of solid solution on the basis of titanium carbide. By a modification of the composition of the solid nickel solutions and of the content of titanium carbide alloys with different properties can be produced. There are 9 figures, 2 tables, and 9 references, 5 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Metallurgical Institute imeni A. A. Baykov, AS USSR)

Card 2/3

AUTHOR: Kornilov, I. I. 78-3 3-33/47

TITLE: Discussion of Lectures (Obsuzhdeniye dokladov)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 727-728 (USSR)

ABSTRACT: 1) I. I. Kornilov points out that the method of intermetal analysis (intermetallidnyy) the method of selective phase separation in various polyphase systems, is of great importance. This method makes it possible to determine the composition and the structure of the alloys of the corresponding phase, to investigate the character of the interaction of the components of complicated polymetal systems and to use them in the construction of phase diagrams. According to the lecture by L. I. Pryakhina dealing with the investigation method of polycomponent systems the given system can on certain conditions be brought to the investigation of quasi-binary-two-phase systems consisting of two kinds of solid solutions - metal and metalloid. Without knowing the nature of this phase composition it can not be synthetized

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but it can be separated by means of intermetallide analysis. By means of the method of the chemical separation of this phase it can be completely isolated and the compositions of polycomponent metalphases can be entered in the phase diagram of the same quasibinary system. - The speaker wished R. B. Golubtsova a successful continuation of her investigations she had been lecturing on. - I. I. Kornilov points out that the contradictions mentioned by Yu. Bagaryatskiy exist only apparently but not infact. The values of intermetallide analysis prove that there exist compounds in which great quantities of elements dissolve and where metallide solid solutions of saturated concentration can form.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR, Moskva (Moscow, Institute for Metallurgy imeni A. A. Baykov, AS USSR)

78-3 3-41/47

AUTHORS: Kornilov, I. I., Mikheyev, V. S., Chernova, T. S.

TITLE: An Investigation of the Equilibrium Diagram of the System Titanium-Chromium-Aluminum (Issledovaniye diagrammy ravnovesiya titan-khrom-alyuminiy)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 786-796 (USSR)

ABSTRACT: On the basis of the investigation of the microstructure of titanium-chromium-aluminum alloys in a hardened and annealed state the phase diagrams were not only constructed by the isothermal sections, but by the sections between the temperature of 1200°C and room temperature. It was found that the α-phase of the solid solution of α-titanium at room temperature lies in the triangular concentration of 1,5 % chromium and 20 % aluminum. The domain of the γ-phase lies at about 0,8 % chromium and 38 % aluminum. The investigations of the γ-domain and of the two phases $\alpha+\gamma_1$ as well as the boundary of distribution in the concentration triangle titanium-chromium-aluminum were determined. The alloys in

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78-3-3-41/47

An Investigation of the Equilibrium Diagram of the System Titanium-Chromium--Aluminum

a hardened and annealed state have microstructures, consisting of solid solutions of the α- and β-modification, the metallic compound TiAl(γ') and Ti_2Cr_3 or the -phase. The two-phase domains consist of $\alpha+\gamma$, $\alpha+\beta$ and $\alpha+\gamma_1$, $\beta+\gamma$ and $\gamma+\gamma_1$-phases. The three-phase domains consist of the α, β and γ'-phase. In the present work the occurrence of the $\alpha+\beta+\gamma$-phase at 760°C was not confirmed, but only the occurrence of the $\alpha+\beta$-phase. The specific electric resistance and the temperature coefficient of the alloys titanium-aluminum-chromium in dependence on the aluminum- and chromium-content were examined. It was found that titanium-chromium-aluminum alloys are characterized by a high electric resistance at room temperature which is dependent on the chromium- and aluminum-content. Titanium-chromium-aluminum alloys with a content up to 12,8 % aluminum are not magnetic or plastic, and permit the treatment in hot state. There are 8 figures, 4 tables, and 6 references, 4 of which are Soviet.

SUBMITTED: June 25, 1957

Card 2/2

AUTHOR: Kornilov, I. I. 78-3-4-4/38

TITLE: None Given.

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 4, pp. 859-860 (USSR)

ABSTRACT: Here the great importance of investigating the solid solutions with respect to their practical application in industry, especially of the boride-, carbide- and silicide compounds is introductorily discussed. The author criticizes those researchers, who separate certain phases from polycomponent steel or other alloys, and then want to attribute to them the empiric formula with different atomic conditions. According to the author's opinion the phase analyses should be rationally applied in order to determine the cases of solid alloys, instead of searching for constant chemical compounds. The author recommends to consider most attentively the principles of Kotel'nikov, which he gave in his lecture (May 20, 1957). By means of examples the author maintains that the same compounds may or may not be considered as solid solutions. From the viewpoint of metallic compounds titanium -

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None Given 78-3-4-4/38

zirconium form a continuous solution on account of their similarity of atomic radii, on the other hand, according to the great differences of these radii, magnesium-nickel do not show any traces of a mutual solution. If, however, within the TiO_2 and ZrO_2 compounds or within the NiO and MgO compounds ionic conditions instead of atomic conditions are assumed, other results are obtained. The difference of magnitude between titanium- and zirconium ions does not permit any formation of a solid solution; the contrary can be determined with magnesium and nickel the ions of which are similar. Most of the lectures delivered at the last conference were devoted to the boride- and sulfide systems. The same trend in scientific works can be noticed abroad as well, because in this case the important fields of producing solid and super-solid materials are concerned.

ASSOCIATION: Institut metallurgii im. A. A. Baykova AN SSSR, Moskva (Institute of Metallurgy imeni A.A. Baykov, AS USSR, Moscow)

Card 2/2

78-3-4-8/38

AUTHORS: ~~Kornilov, I. I.,~~ Polyakova, R. S.

TITLE: The Phase Diagram of the System Titanium-Niobium-Molybdenum (Diagramma sostoyaniya troynoy sistemy titan-niobiy-molibden)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 4, pp. 879-888 (USSR)

ABSTRACT: The aim of this paper is the investigation of the composition of the components in the three-component system titanium-niobium-molybdenum as well as the construction of the phase diagram of this system.
The alloys were investigated by the following methods: differential analysis, structure determination, determination of hardness, determination of electric resistivity and of its temperature coefficient.
Based on these investigations the authors found that
1) the components niobium and tantalum with β-titanium form continuous solid solutions with volume-centered cubic lattice in the polymorphous transition from $\alpha \rightleftarrows \beta$-titanium;
2) the temperature of the polymorphous transition from $\alpha \rightleftarrows \beta$-titanium decreases gradually with the increase of the niobium- and molybdenum concentration!
3) the properties of hardness and of specific electric re-

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sistance in the ternary system in hardened and annealed state change according to the melting curve in the field of ternary solid solutions;
4) the boundary of the transition from $\alpha + \beta \rightarrow \beta$ of the solid solutions does not influence the hardness and the electric conductivity of the alloys;
5) there is always a small field of α-solid solution on the basis of titanium in the titanium corner bordering the two-phase range $\alpha + \beta$. The range $\alpha + \beta$ with the increase of the content of niobium and molybdenum passes over into the ternary solid solution of β-titanium.
A phase diagram of the system titanium-niobium-molybdenum was found and constructed in hardened and annealed state. There are 11 figures, 3 tables, and 10 references, 6 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Metallurgical Institute imeni A. A. Baykov, AS USSR)

SUBMITTED: June 25, 1957

AUTHOR: Kornilov, I.I., Professor SOV/63-3-6-15/43

TITLE: Corrosion-Resistant Titanium and Its Alloys (Korrozionnostoykiye titan i yego splavy)

PERIODICAL: Khimicheskaya nauka i promyshlennost', 1958, Vol III, Nr 6, pp 803-807 (USSR)

ABSTRACT: Titanium together with zirconium, vanadium and niobium has recently gained great importance. The composition of titanium obtained by different methods is shown in Table 1. Admixtures of oxygen, hydrogen and nitrogen increase the resistance of pure titanium, but reduce its plasticity (Table 2). If titanium is put in diluted salt solutions, it shows a negative potential of 0.27 v, but after some time a positive potential of 0.46 v, which means that its corrosion resistance increases considerably. It is higher than in stainless steel. Hydrochloric, sulfuric, orthophosphoric and formic acid destroy titanium. Aggressive media are also aluminum chloride, sodium peroxide, fluorine compounds, etc. Titanium does not react with elements of the groups I and II of the periodic system. With groups VI and VII it forms ionic or covalent compounds. With the other groups it forms solid solutions. In Table 4 and Figures 2-3 the principal properties of the titanium alloys are shown. Titanium is

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SOV/63-3-6-15/43

Corrosion-Resistant Titanium and Its Alloys

used in aviation and the manufacture of rockets and artificial satellites, in submarines and torpedoes, in chemical apparatuses for aggressive media, etc. Titanium injectors operating in diluted hydrochloric acid show no corrosion after 2.5 years, whereas cast iron injectors get out of service after 3 months. Mixing drums for chlorine dioxide covered with titanium sheets show no corrosion after one year of service, whereas the usual nickel-chromium-molybdenum drums must be replaced after 5 hours. Titanium pipes are used for the distillation of nitric acid.

There are 4 tables, 4 graphs, and 23 references, 12 of which are Soviet, 7 English, 3 German, and 1 French.

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76-3-6-17/30

AUTHORS: Kornilov, I. I., Pylayeva, Ye. N., Volkova, M. A.

TITLE: II. Investigations of Equilibrium in the Ternary System Ti-Al-Fe (II. Issledovaniye ravnovesiya v troynoy sisteme Ti-Al-Fe)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 6, pp. 1391-1397 (USSR)

ABSTRACT: The ternary system Ti-Al-Fe, *especially in the angle of titanium of up to 30 % of the sum Al+Fe, was investigated by means of thermal, micro-structural - and X-ray analysis.

The alloys produced were investigated with respect to their hardness and temperature-stability. The solid solution of aluminum and iron covers a vast range in β-titanium at 1100°C.

The phase-compositions were investigated at temperatures of 1100, 1000, 800 and 550°C. A large part of the alloys undergoes eutectoid transition into solid solutions like in the systems Ti-Fe: β → α + TiFe.

The occurence of the β-phase in the biphase-range α+TiFe

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II. Investigations of Equilibrium in the Ternary System Ti-Al-Fe 78-3-6-17/30

increases according to the increase in temperatures of from 680°C to 850°C, according to the increase of the aluminumcontent in the alloys.
In the ternary system Ti-Al-Fe the γ-phase dissipates at 1100°C of from 40 % to 47 % Al. The maximum solubility of iron in this phase amounts to approximately 1,5 %.
A decrease in the hardness of the alloys takes place in the range of the γ-solid solution in the ternary system Ti-Al-Fe. The alloys with γ-phase retain their hardness when heated up to a temperature of 700°C, whereas at temperatures of from 700 to 950°C the hardness of the alloys decreases to a smaller extent than in titanium alloys on the basis of the α-phase.
There are 17 figures, and 13 references, 4 of which are Soviet.

SUBMITTED: June 26, 1957

AVAILABLE: Library of Congress

Card 2/2

1. Aluminum-iron-titanium alloys--Phase studies 2. Aluminum-iron-titanium alloys--Production

SOV/78-3-11-20/23

AUTHORS: Kornilov, I. I., Polyakova, R. S.

TITLE: Investigation of the Annealing Stability of Platinum Alloys With Rhodium, Iridium, Aluminum, and Chromium (Issledovaniye zharostoykosti splavov platiny s rodiyem, iridiyem, alyuminiyem i khromom)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1958, Vol 3, Nr 11, pp 2553-2561 (USSR)

ABSTRACT: The annealing stability of platinum, alloyed with rhodium, iridium, aluminum, and chromium is investigated. The loss in weight in the case of a heating of the metals of the platinum group in air at 1300°C is given in figure 1. The loss in weight of platinum in the case of heating in air, in vacuum, in an oxygen atmosphere, and in inert gas is given in figure 2. The investigation of the annealing stability of platinum alloyed with rhodium, iridium, aluminum, and chromium was carried out at 1200°C in air. The results show that rhodium in platinum alloys reduces the loss in weight in the case of annealing. Alloys with 10 - 40 percent by weight iridium represent solid solutions. An alloy with 40% Ir suffers after a 100 hours annealing at 1200°C a loss in weight ten times higher than

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SOV/24-58-4-5/39

AUTHORS: Vlasov, V.S., Kornilov, I.I. (Moscow)

TITLE: The Composition-Heat Resistance Diagrams of the Binary Titanium-Vanadium and Titanium-Niobium Systems (Diagrammy sostav-zharoprochnost' dvoynykh sistem titan-vanadiy i titan-niobiy)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 4, pp 31 - 35 (USSR)

ABSTRACT: The binary systems were investigated up to 50 weight % of vanadium and niobium. The specimens were made by powder-metallurgical methods, pressing the powder into rectangular rods, heating in vacuo at 1 400 °C for 48 hours and finally turning them down into cylinders of 45 mm length and 4 mm diameter. Heat resistance was measured by a centrifugal method (Ref 4), consisting of determination of deflection δ (in mm) produced by a bending stress σ (in kg/mm^2). Heat resistance was expressed as the time required τ (in hours) to produce a given deflection (5, 10 or 15 mm). The investigation was carried out in three successive stages (1) 100 hours at 500 °C with a

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bending stress of 15 kg/mm^2, (2) 100 hours at 500 °C and 20 kg/mm^2 and (3) 100 hours at 600 °C and 20 kg/mm^2. The Ti-V alloys fractured in the first stage. Several Ti-Nb alloys endured a considerable time at 500-600 °C and 15-20 kg/mm^2. The dependence of the deflection δ on the V and Nb content is given in Figures 1 and 2. Hardness-composition curves (above) and heat resistance-composition curves (below) are shown in Figures 3 and 4. The dotted curve in Figure 4 shows hardness of Ti-Nb alloys before test. The continuous hardness curves are those taken after the test. In the α region heat resistance increases with increase in Nb or V to a maximum at limiting solubility. In the α + β region there is a heat resistance minimum. Hardness also increases in the α region to a maximum. There is a continuous decrease in hardness in the α + β region, except for the case where hardness was measured before the test. Figure 5 shows the microstructures before and after test. This shows the breaking up of the grains

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KORNILOV, ~~A~~. I. I.

SOV/24-58-6-5/35

AUTHORS: S.G. Glazunov, I.I. ~~Kornilov~~ and A.M. Yakimova

TITLE: The Effect of Hydrogen on the Structure and Properties of Titanium and its Alloys (Vliyaniye vodoroda na strukturu i svoystva titana i yego splavov)

PERIODICAL: Izvestiya akademii nauk SSSR, otdeleniye tekhnicheskikh nauk, 1958, Nr 6, pp 30-36 (USSR)

ABSTRACT: On the basis of data published by various investigators up to 1956 the authors of this paper constructed a more accurate equilibrium diagram of the system titanium-hydrogen showing the region of low temperature transformations. They arrived at the conclusion that the mechanism of hydrogen embrittlement of titanium is determined by the type of the structure of the alloy, namely: a) In technical titanium and in alloys with the α structure embrittlement is due to the presence of the hydride phase formed as the result of the eutectoid transformation. The main manifestation of the hydrogen embrittlement of the alloys with the α structure is their increased notch sensitivity. b) There is no evidence of the formation of the hydride phase in the

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The Effect of Hydrogen on the Structure and Properties of Titanium and its Alloys

alloys with the β or $(\alpha + \beta)$ structure and little is known about the mechanism of embrittlement in alloys of this type. The presence of hydrogen in the $(\alpha + \beta)$ alloys is revealed by low ductility of materials tested for tensile strength at slow rates of loading, and by premature brittle fracture in creep at room temperature. Alloys with the β structure are not sensitive to hydrogen even when it is present in quantities that markedly affect the properties of the α and $(\alpha + \beta)$ alloys. The original properties of titanium alloys, which are adversely affected by the presence of hydrogen, can be restored by a suitable vacuum heat treatment.
There are 28 references (21 English, 3 Soviet, 3 German and 1 French)

Submitted: July 8, 1957

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SOV/24-58-7-28/36

AUTHORS: Vlasov, V.S. and Kornilov, I.I. (Moscow)

TITLE: Composition Versus Hot-strength Diagrams for Alloys of the Ternary System Titanium-vanadium-niobium (Diagrammy sostav-zharoprochnost' splavov troynoy sistemy titan-vanadiy-niobiy)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 7, pp 136 - 139 (USSR)

ABSTRACT: The diagrams of the ternary system titanium-vanadium-niobium constructed by the authors (Ref 3) showed that all the alloys of the ternary system crystallise as continuous solid solutions. Specimens after hot-strength tests (200-250 hours at 500-600 °C) have either a single-phase α and β or a two-phase $\alpha + \beta$ structure (Figure 1). The boundaries of these regions with adjacent binary system diagrams and the titanium corner are shown in Figure 2. In the authors' experiments power-metallurgy methods were used to prepare 5 x 5 x 100 mm rectangular blanks from 99.5% pure Ti, 98.7% pure V and 98.7% pure Nb. After vacuum fusion cylindrical test pieces 45 mm long and 4 mm in diameter were machined. Three series of

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Composition Versus Hot-strength Diagrams for Alloys of the Ternary System Titanium-vanadium-niobium

compositions with V:Nb ratios of 3, 1 and 1/3 were used. The centrifugal test method (Ref 5 in Ref 1) was used. In the first stage of testing (100 hours) the temperature was 500 °C and the bending stress 15 kg/mm^2; in the next 100 hours the stress was 20 kg/mm^2 at the same temperature; in the final 100 hours the temperature was 600 °C at the same stress. The measure of hot strength was the time taken to produce a deflection of 5, 10 or 15 mm. In Figure 3, these times are plotted against composition and compared with hardness vs composition curves before and after testing. Discussing their results in terms of phase changes the authors conclude that for the titanium corner of the ternary diagram the hot-strength maximum of the α-phase corresponds to its saturation limit; in the α + β two-phase region there is a minimum determined by the branches of the hot-strength curves descending from the boundaries of the two-phase with the one-phase region. The relations obtained are in agreement with theory (Ref 5 in Ref 1), with the authors' results for binary

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Composition Versus Hot-strength Diagrams for Alloys of the Ternary System Titanium-vanadium-niobium

Ti-V and Ti-Nb systems (Ref 1) and with other experimental results. In general, the authors conclude that for test temperatures such that hot strength depends mainly on a solution-precipitation mechanism of interaction at the phase boundaries the nature and number of the alloy components of a system influence the level of values in hot-strength vs composition diagrams, while the shape of the diagram is influenced by the phase composition and structure. There are 3 figures and 4 references, 3 of which are Soviet and 1 English.

SUBMITTED: August 9, 1957

Card 3/3

SOV/24-58-9-3/31

AUTHORS: Glazunov, S.G., Kornilov, I.I. and Yakimova, A.M. (Moscow)

TITLE: The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1 (Vliyaniye vodoroda na strukturu i svoystva promyshlennykh splavov VT2, VT3, VT3-1)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 9, pp 17 - 24 (USSR)

ABSTRACT: The experimental specimens were prepared from commercial quality, Ti-based alloys of the ($\alpha + \beta$) type, the main alloying elements being Cr and Al (alloys VT2 and VT3), or Cr, Al and Mo (alloy VT3-1). The complete chemical analysis of the alloys is given in a table on p 17. An industrial h.f. induction furnace was used for the preparation of the VT2 alloys which were melted in a graphite crucible, in a neutral atmosphere. The VT3 and VT3-1 alloys, melted in a vacuum-arc furnace with a water-cooled copper hearth using a consumable electrode, were characterised by a much lower C, H and N content. To ensure that the effect of H on the properties of the VT2 alloys would not be obscured by the effect of other

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The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

metallurgical factors, the following procedure was adopted. Two melts with a maximum H content were selected and one half of this material was vacuum annealed (96 hours at 700 °C). After this treatment which reduced the H content of the alloy from 0.06 to 0.009 wt%, both the treated and untreated materials were normalised (30 minutes at 1 050 °C followed by air cooling). To obtain specimens of the VT3 and VT3-1 alloys with the H content varying between 0.005 and 0.12 wt%, the alloys placed in evacuated quartz ampules together with a quantity of titanium hydride were held for 10 hours at 700 °C and cooled in water. The H content was calculated from the increase of weight of the alloy specimens, the accuracy of this method having been confirmed by the results of the vacuum-fusion and spectrographic analysis. To ensure that all the materials were in the same structural condition, they were heat-treated in the following manner: alloy VT3 - air cooled after 3 hours at 750 °C; alloy VT3-1 - air cooled after 30 min at 870 °C and 1 hour at 650 °C.

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The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

For the tensile tests of the VT2 and VT3-1 alloys, both the standard and notched test pieces were used (V-notch, 60° angle, 0.5 mm root diameter), the rate of strain being 14.5 mm/min. The tensile strength of the standard and notched specimens ($\sigma_B^{(1)}$ and $\sigma_B^{(2)}$ respectively), elongation, δ, and reduction of area, ψ, of the VT2 alloy with a low and high H content tested at various temperatures (-70 to + 400 °C) are given in Table 1. The effect of the rate of strain, v, on σ_B, δ and ψ of the VT2 and VT3-1 (Table 2) was studied at room temperatures on standard test pieces at v = 0.16, 14.5 and 56.5 mm/min. The impact strength (a), of these two alloys in relation to their H content, q, was determined in the +20 to -70 °C temperature range and the results are reproduced graphically in Figure 1. The thermal stability of the VT3 and VT3-1 alloys was studied by means of room temperature tensile tests (v = 14.5 mm/min) carried out on test pieces heat-treated at 400 and 450 °C

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The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

for 100 hours. Figures 2 and 3 show how σ_B, δ and ψ of these two alloys (in the untreated state and after treatment at 400 and 450 °C) are affected by their hydrogen content. The fatigue limit and creep resistance of the VT2 alloy with a high and low H content was also tentatively investigated. The analysis of the results of the mechanical tests and examination of the microstructure of the investigated alloys led to the following conclusions: 1) Although the notch sensitivity of the VT2 and VT3-1 alloys at room temperature increases rapidly with increasing H content, the mechanical properties of these alloys as measured by the standard tensile test on unnotched test pieces are not affected by the presence of 0.005 to 0.08%.H. 2) Since the tensile strength of the VT2 and VT3-1 alloys increases with increasing rate of strain, the testing procedures for Ti alloys should be standardised. 3) Variation of the H content in the 0.005 - 0.08% range does not affect the low temperature (-40 to -70 °C) impact strength of the VT2 and VT3-1 alloys. 4) When the H content of the VT3 alloy reaches 0.015%,

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the alloy becomes brittle after 100 hours at 400 or 450 °C. This critical value of the H content can be considerably increased by addition of 1-2% molybdenum. 5) The eutectoid decomposition of the β-phase in the VT3 alloy resulting in the precipitation of an intermetallic compound $TiCr_2$ is accelerated by the presence of 0.015 - 0.035% H. On the other hand, no eutectoid decomposition of the β-phase was observed in the VT3-1 alloy (VT3 alloy with 1.5% Mo) containing up to 0.12% H (Figure 4). 6) A considerable reduction of the H content of the commercial Ti alloys can be attained by the application of the more modern melting technique of vacuum-arc fusion instead of h.f. melting in a neutral atmosphere. 7) If necessary, the H content of VT2 alloys can be considerably reduced by a 12-hour annealing treatment at 700 °C in vacuum of the order:

$$3 \times 10^{-3} - 1 \times 10^{-4} \text{ mm Hg.}$$

This treatment increases the ductility of the alloy without

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lowering its tensile strength, improves the creep resistance but does not affect the fatigue limit of the alloy.
There are 4 figures and 4 tables.

SUBMITTED: July 8, 1957

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AUTHORS: Kornilov, I. I., and Shinyayev, A. Ya. (Moscow)

TITLE: Diffusion in Alloys of the System Nickel-Chrome-Tungsten-Aluminium-Titanium (Diffuziya v splavakh sistemy nikel'-khrom-vol'fram-alyuminiy-titan)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 10, pp 96-99 (USSR)

ABSTRACT: The resistance to loading of alloys in this system, according to the work of Kornilov and Titov (Ref.3), depends essentially on the composition of the alloy and temperature. As the temperature increases from 600 to 750°C, the region of maximum strength is displaced from alloys with a titanium content of 1.8 to 4.5 wt.% towards alloys containing 1.3 to 3.3 wt.%. However, the region of maximum strength on further increase in temperature (up to 1000°C) is displaced in the direction of alloys with a high titanium content. Only at temperatures above 1100°C is the region of maximum strength of the alloys rapidly displaced in the direction of dilute solid solutions. Microscopic, X-ray and other investigations of these alloys, which have been carried out in this work (Ref.3) have shown that the maximum solubility of titanium at a temperature of 1100°C is of the order of 1 wt.%. On raising the temperature, the solubility of titanium increases

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considerably and at 1200°C it exceeds 4 wt.%. In alloys containing excess titanium a phase based on Ni_3Al is precipitated in which some aluminium atoms are displaced by titanium. The lattice parameter of the solid solution increases from 3.57 to 3.58 Å with increase in titanium content from 1 to 9 wt.%. For the investigation of diffusion, alloys with constant contents of Cr (20 wt.%), W (6 wt.%) and Al (4.5 wt.%) were prepared and had the following quantities of titanium: 1, 2, 3, 5, 7 and 9 wt.%. All these prepared alloys were heat treated at 1200°C for four hours prior to diffusion annealing. Investigation of the micro-structure of these alloys showed that the crystal size of the solid solutions of alloys in this system was 300 to 400 μ and changed very little with increased annealing time. At a titanium content of 3 wt.% and above, an intermetallic phase precipitates out along the grain bodies and boundaries, the quantity of which increased with increase in titanium content. The investigation of diffusion in selected alloys was carried out at four temperatures, namely,

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955, 1060, 1165 and 1250°C. The duration of diffusion annealing varied from 400 to four hours. In order to carry out the annealing, the specimens were sealed under vacuum into a double-walled quartz ampoule. A titanium shaving was placed between the walls. Measurement of the diffusion coefficients D was carried out by removing thin layers from the specimen by electrolytic polishing and measuring the radio-activity of the substance removed during the time of polishing (Ref.4). The accuracy of measurement was 5 to 8%. Radio-active Fe^{59} was used as the diffusing substance, since it is closest in its physical and chemical properties to nickel. The results of measurements of the diffusion coefficient of iron in alloys of the system Ni-Cr-W-Al-Ti are given in the table, p 97. Change of the value D in relation to the titanium content in the investigated alloys is given in Fig.1. From this figure it can be seen that the curves representing the dependence of D on the composition of the alloy show distinct minima for D, the position of which is temperature dependent. As the temperature at which the diffusion investigation is carried out is increased, the minimum value of D is always displaced from two-phase alloys towards the unsaturated solid solutions.

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KORNILOV, I.I.

AUTHOR: Turovtseva, Z. M., Candidate of Physical and Mathematical Sciences SOV/30-58-9-43/51

TITLE: Analysis of Gases in Metals (Analiz gazov v metallakh) Conference in Moscow (Soveshchaniye v Moskve)

PERIODICAL: Vestnik Akademii nauk SSSR, 1958, Nr 9, pp. 114 - 115 (USSR)

ABSTRACT: The conference took place in Moscow from June 24 to June 27. It was organized by: The Institut geokhimii i analiticheskoy khimii im.V.I.Vernadskogo i Komissiya po analiticheskoy khimii Akademii nauk SSSR (Institute of Geochemistry and Analytic Chemistry imeni V.I.Vernadskiy and the Committee for Analytic Chemistry of the AS USSR). 34 reports were heard and discussed.
Yu.A.Klyachko reported on different forms of the state of gases in metals and the selection of corresponding methods of analysis.
I.I.Kornilov spoke about the results of investigations of the phase diagram of the systems of the IV. column of elements containing oxygen and their importance for analytic chemistry.
L.L.Kunin, Ye.M.Chistyakova dealt with physico-chemical bases of gas determination in metals by means of melting

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in a vacuum.
A.N.Zaydel' and his collaborators reported on the further development of the isotopic equilibrium method for the determination of hydrogen in metals.
Ye.D.Malikova's report dealt with problems of oxygen analysis in alkaline and alkali earth metals.
The members of the conference stated that it is the most important task in the field of analysis of gases in metals to increase the sensitivity and exactness. The development of spectrum methods of gas analysis in metals has to be promoted. The industrial production of devices has to be organized.

KORNILOV, I.I.

A high-temperature centrifuge for creep, rupture, and bend tests. I. I. Kornilov (Acad. Sci., Moscow). *J. Metals* 10, 157-9(1958).—The centrifugal method for studying the strength of alloys in bending may be applied and for investigating the regularity of the variation of strength with compn. and structure at different temps. C. L. Mantell

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20-119-3-28/65

AUTHORS: Kornilov, I. I., Pryakhina, L. I., Ozhimkova, O. V., Snetkov, A. Ya.

TITLE: On the Quasi-Binary Nature of the Six-Component Solid Nickel Solution System Plus Titanium Carbide (O kvazibinarnosti sistemy: shestikomponentnyy nikelevyy tverdyy rastvor + karbid titana)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 3, pp. 501-503 (USSR)

ABSTRACT: The working out of new rational investigation methods of the poly-component metal systems is necessary since general principles of their study are missing and a clear demonstration is difficult. Since the metals incline towards formation of solid solutions and compounds, furthermore of solid solutions on the strength of these compounds, much less phases develop in poly-component systems than can be assumed from the number of the components taking part. In consequence of the chemical affinity between the elements and in consequence of a certain activity degree of the reacting elements in such systems it is possible to reduce the investigation of the systems to the study of the equilibrium

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... This solution was assumed as initial phase and the phase equilibrium in this eight-component system was

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determined. Nickel formed 82 %. Titanium carbide was added in quantities of from 0 to 95 %. The samples were produced by means of melting (up to 15 % Ti) and by means of powder metallurgical methods (25-95 % TiC). Furthermore the hardness of alloys rich in nickel was studied after hardening at 1250, 1200, and 1000°C. In order determine the temperature interval of the crystallization of the alloys with from 0 to 15 % TiC, a thermal analysis was carried out. Figure 2 gives the fusibility diagram of the alloy mentioned in the title. The investigation of the microstructure of casted and hardened alloys confirms the eutectic structure of the corresponding alloy compositions. The solubility determination was carried out metallographically and radiographically. It was found that the TiC-solubility in the solid solution in question changes with the temperature at 1300°-1,9 %, at 1250°-1,4 %, at 1200°-0,4 % and at 1000°C approximately 0,1% TiC. In alloys with more than 5 % TiC, titanium carbide forms the phase which at first crystallizes. Its great cubical crystals are interspersed in the eutectic. In an

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